

## CLAIMS

What is Claimed is:

- 1        1. A fin actuator(s), in a portable missile, that substantially limits backlash, comprising:  
2                means for rotating a power shaft, said means for rotating operatively configured  
3                to rotate said power shaft in a forward direction and a reverse direction;  
4                means for converting rotational movement of said power shaft to linear  
5                movement, wherein said means for converting rotational movement of said power shaft  
6                includes a lead screw fixedly coupled to said power shaft, said lead screw having a lead  
7                nut threadingly engaged moving linearly along said lead screw in relation to the direction  
8                of rotation of said power shaft; and  
9                means for converting said linear movement of said lead nut to rotational movement  
10              of a fin shaft, wherein said means for converting said linear movement includes said lead nut  
11              operatively coupled to a crank arm, said crank arm fixedly coupled to said fin shaft,  
12              effecting the rotation of said fin shaft according to the linear movement of said lead nut.
- 1        2. The actuator(s) of claim 1, wherein said means for rotating a power shaft comprises a  
2              reversible electric motor.
- 1        3. The actuator(s) of claim 1, wherein said lead screw, said lead nut, and said crank arm are so  
2              constructed and coupled as to limit the total backlash of said actuator(s) measured at said fin  
3              shaft to less than about 0.1 degrees.

1 4. The actuator(s) of claim 1, wherein said actuator(s) is dimensioned and configured to fit in  
2 said portable missile of less than about 5 lbs.

1 5. The actuator(s) of claim 1, wherein said actuator(s) is dimensioned and configured to fit in  
2 an actuator section of said portable missile of less than about 2 inches in diameter.

1 6. The actuator(s) of claim 1, wherein said actuator(s) is dimensioned and configured to fit in  
2 an actuator section of said portable missile of less than about 3 inches in length.

1 7. The actuator(s) of claim 1, wherein said actuator(s) is dimensioned and configured to  
2 provide at least about 50 oz-in of torque to said fin shaft.

1 8. The actuator(s) of claim 1, wherein said actuator(s) is dimensioned and configured to  
2 provide from at least about -20 degrees to at least about +20 degrees of deflection of said fin  
3 shaft.

1 9. The actuator(s) of claim 1, wherein said crank arm and said fin shaft is a unitary structure.

1 10. A method for fin actuation(s), in a portable missile, that substantially limits backlash,  
2 comprising:

3 providing a means for rotating a power shaft, said means for rotating operatively  
4 configured to rotate said power shaft in a forward direction and a reverse direction;

5 providing a means for converting rotational movement of said power shaft to linear  
6 movement, wherein said means for converting rotational movement of said power shaft includes  
7 a lead screw fixedly coupled to said power shaft, said lead screw having a lead nut threadingly  
8 engaged moving linearly along said lead screw in relation to the direction of rotation of said  
9 power shaft; and

10 providing a means for converting said linear movement of said lead nut to rotational  
11 movement of a fin shaft, wherein said means for converting said linear movement includes said  
12 lead nut operatively coupled to a crank arm, said crank arm fixedly coupled to said fin shaft,  
13 effecting the rotation of said fin shaft according to the linear movement of said lead nut.

1 11. The method of claim 10, wherein said means for rotating a power shaft comprises a  
2 reversible electric motor.

1 12. The method of claim 10, wherein said lead screw, said lead nut, and said crank arm are so  
2 constructed and coupled as to limit the total backlash measured at the fin shaft to less than  
3 about 0.1 degrees.

1 13. The method of claim 10, wherein said fin actuation(s) occurs within a portable missile of  
2 less than about 5 lbs.

1 14. The method of claim 10, wherein said fin actuation(s) occurs within an actuator section of  
2 said portable missile of less than about 2 inches in diameter.

1 15. The method of claim 10, wherein said fin actuation(s) occurs within an actuator section of  
2 said portable missile of less than about 3 inches in length.

1 16. The method of claim 10, wherein said fin actuation(s) provides at least about 50 oz-in of  
2 torque to said fin shaft.

1 17. The method of claim 10, wherein said fin actuation(s) provides from at least about -20  
2 degrees to at least about +20 degrees of deflection of said fin shaft.

1 18. The method of claim 10, wherein said crank arm and said fin shaft is a unitary structure.

1 19. A fin actuator(s), in a portable missile, that substantially limits backlash, comprising:  
2 a reversible electric motor for rotating a power shaft, said power shaft extending  
3 from said motor;  
4 a lead screw fixedly coupled to said power shaft, said lead screw having a lead nut  
5 threadingly engaged moving linearly along said lead screw in relation to the direction of  
6 rotation of said power shaft; and  
7 said lead nut operatively coupled to a crank arm, said crank arm fixedly coupled to  
8 said fin shaft, effecting the rotation of said fin shaft according to the linear movement of said  
9 lead nut.

1        20. The actuator(s) of claim 19, wherein said lead screw, said lead nut, and said crank arm are  
2                so constructed and coupled as to limit the total backlash of said actuator(s) measured at said  
3                fin shaft to less than about 0.1 degrees.

1        21. The actuator(s) of claim 19, wherein said actuator(s) is dimensioned and configured to fit in  
2                said portable missile of less than about 5 lbs.

1        22. The actuator(s) of claim 19, wherein said actuator(s) is dimensioned and configured to fit in  
2                an actuator section of said portable missile of less than about 2 inches in diameter.

1        23. The actuator(s) of claim 19, wherein said actuator(s) is dimensioned and configured to fit in  
2                an actuator section of said portable missile of less than about 3 inches in length.

1        24. The actuator(s) of claim 19, wherein said actuator(s) is dimensioned and configured to  
2                provide at least about 50 oz-in of torque to said fin shaft.

1        25. The actuator(s) of claim 19, wherein said actuator(s) is dimensioned and configured to  
2                provide from at least about -20 degrees to at least about +20 degrees of deflection of said fin  
3                shaft.

1        26. The actuator(s) of claim 19, wherein said crank arm and said fin shaft is a unitary structure.